

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
17 July 2003 (17.07.2003)

PCT

(10) International Publication Number
WO 2003/058607 A3

(51) International Patent Classification⁷: **G10L 21/02**

(74) Agent: **GROENENDAAL, Antonius, W., M.**; Philips Intellectual Property & Standards, Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(21) International Application Number:
PCT/IB2002/005295

(22) International Filing Date: 9 December 2002 (09.12.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
02075081.6 9 January 2002 (09.01.2002) EP

(71) Applicant (for all designated States except US): **KONINKLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

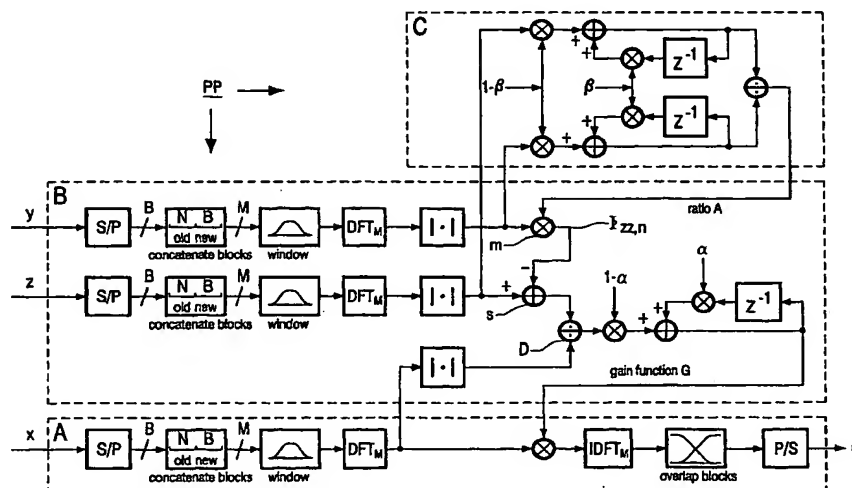
Published:

— with international search report

(88) Date of publication of the international search report:
6 May 2004

[Continued on next page]

(54) Title: AUDIO ENHANCEMENT SYSTEM HAVING A SPECTRAL POWER RATIO DEPENDENT PROCESSOR



(57) Abstract: An audio enhancement system is described, comprising audio signal inputs for a distorted desired signal and at least a reference signal, and a spectral processor coupled to the microphone array for processing the distorted desired signal by means of the reference signal acting as an estimate for the distortion of the desired signal. The spectral processor is arranged for modifying said processing such that the estimate for the distortion depends on A times the spectral power of the reference signal, where A is the ratio between the time averaged spectral power of the distortion of the distorted desired signal and the time averaged spectral power of the reference signal. The frequency dependency of the ratio A which is included in the distortion estimate, results in an improved audio enhancement system which is better suited for application in situations wherein the relation between the interfering signal and the distortion in the desired signal is not known in advance, such as for example in a car environment.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

PCT/IB 02/05295

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G10L21/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G10L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC, IBM-TDB, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	WO 02 07151 A (BURNETT GREGORY C ;ALIPHCOM (US); BREITFELLER ERIC F (US)) 24 January 2002 (2002-01-24) abstract page 10, line 20 - line 30 page 5, line 25	1,5
P,X	US 2002/039425 A1 (BURNETT GREGORY C ET AL) 4 April 2002 (2002-04-04) abstract; claims 1-8 -/--	1,9,10

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *Z* document member of the same patent family

Date of the actual completion of the international search

30 December 2003

Date of mailing of the international search report

15/01/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Van Doremalen, J

INTERNATIONAL SEARCH REPORT

PCT/IB 02/05295

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BOUQUIN-JEANNES LE R ET AL: "ENHANCEMENT OF SPEECH DEGRADED BY COHERENT AND INCOHERENT NOISE USING A CROSS-SPECTRAL ESTIMATOR" IEEE TRANSACTIONS ON SPEECH AND AUDIO PROCESSING, IEEE INC. NEW YORK, US, vol. 5, no. 5, 1 September 1997 (1997-09-01), pages 484-487, XP000774308 ISSN: 1063-6676 abstract paragraph 'OIII! ---	1,9,10
A	WO 97 45995 A (PHILIPS ELECTRONICS NV ;PHILIPS NORDEN AB (SE)) 4 December 1997 (1997-12-04) cited in the application abstract; claims 1-6 ---	1,9
A	EP 0 856 833 A (NIPPON ELECTRIC CO) 5 August 1998 (1998-08-05) abstract; claim 1 ---	1,3,9,10
A	EP 0 730 262 A (NIPPON ELECTRIC CO) 4 September 1996 (1996-09-04) abstract; claims 1,2 figures 1,2 -----	1,9

INTERNATIONAL SEARCH REPORT

PCT/IB 02/05295

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 0207151	A	24-01-2002	US 2002039425 A1	04-04-2002
			AU 7695501 A	30-01-2002
			CA 2416926 A1	24-01-2002
			CN 1443349 T	17-09-2003
			EP 1301923 A2	16-04-2003
			WO 0207151 A2	24-01-2002
			WO 02098169 A1	05-12-2002
			US 2003128848 A1	10-07-2003
US 2002039425	A1	04-04-2002	AU 7695501 A	30-01-2002
			CA 2416926 A1	24-01-2002
			CN 1443349 T	17-09-2003
			EP 1301923 A2	16-04-2003
			WO 0207151 A2	24-01-2002
			WO 02098169 A1	05-12-2002
			US 2003128848 A1	10-07-2003
WO 9745995	A	04-12-1997	BR 9702254 A	17-02-1999
			CN 1198283 A	04-11-1998
			EP 0843934 A1	27-05-1998
			WO 9745995 A1	04-12-1997
			JP 11510673 T	14-09-1999
			US 2002159585 A1	31-10-2002
EP 0856833	A	05-08-1998	JP 2874679 B2	24-03-1999
			JP 10215193 A	11-08-1998
			AU 736904 B2	02-08-2001
			AU 5278698 A	06-08-1998
			CA 2228097 A1	29-07-1998
			EP 0856833 A2	05-08-1998
			US 6266422 B1	24-07-2001
EP 0730262	A	04-09-1996	JP 2760373 B2	28-05-1998
			JP 8241086 A	17-09-1996
			AU 693648 B2	02-07-1998
			AU 4588696 A	12-09-1996
			CA 2170811 A1	04-09-1996
			EP 0730262 A2	04-09-1996
			US 5644641 A	01-07-1997